ILLUSTRATED
ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 28. No. 13. WEEKLY. | NEW YORK, WEDNESDAY, MARCH 25, 1896. | $3 PER ANNUM. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

In 1883 three men who have since become world famous, were at the University of Strasburg, although they were then unknown to one another or to fame. They were Paderewski, Roentgen and Tesla. Paderewski was at that time an instructor in music in the University; Roentgen was a professor of physics, and Tesla was installing the electric light plant in the University. Of the three men Roentgen was the last to achieve fame. When his X-ray discovery was announced, the recognition of his work was prompt and now he is Baron Roentgen. Tesla has declined several offers of titles and decorations made to him by rulers of foreign countries, but takes a proper pride in the honors conferred upon him by scientific bodies in different parts of the world.

It is proposed to install an electric telpherage system at Sedamsville, on the Ohio River, below Cincinnati, to carry passengers over the river to Lagoon Park on the Kentucky side. The line is to be 120 feet above the river and each car will carry 50 passengers. The line will be supported by two steel towers, 152 feet high, located on either side of the river.

Senator Butler last week introduced a bill at Washington providing for the establishment of a postal telegraph system by the government.

The refusal of the Western Union Telegraph Company to deliver messages to the Sioux City, Iowa, Nursery and Seed Company through an intermediate agent in the latter's employ was held to be illegal by District Judge Ladd on March 16, and the telegraph company was temporarily enjoined from refusing longer to turn over telegrams to such agent. The nursery company's place of business being outside the Western Union's free delivery limits and the two having no means of communication except by mail, the former asked that its messages be turned over to the Postal Telegraph Company, which has a connection with it. This request the Western Union refused on the ground that it would be liable for any miscarriage unless the messages were delivered directly to the nursery company's manager. The court held that, as all companies must act through agents, the delivery to the Postal on the nursery company's authority is sufficient.

One of the latest English electrical novelties is a good imitation of a human hand placed on top of a box. An electrical motor inside the box operates the forefinger of the hand in such a manner as to make it beckon to the passer-by. It is designed for advertising purposes.

The Masonic Temple in Providence, R. I., was destroyed by fire early on the morning of Thursday last, March 19. This will be remembered by many ELECTRICAL REVIEW readers as the building in which the National Electric Light Association held its meeting in February, 1891.

REMOVAL OF WIRES IN BOSTON.

A FINE SHOWING MADE IN THE REPORT OF COMMISSIONER MURPHY.

The results of the work done during the past 18 months by the Wire Department in clearing the streets of Boston of overhead wires, is beginning to be very apparent, even to the casual observer, but it needs a careful study of the annual report of the department, recently completed by John R. Murphy, Commissioner of Wires, to appreciate the vast amount of work actually accomplished, and the plans laid out for its completion.

The Wire Department was organized in August, 1894, and on January 1, 1896, more than half of the whole work of removing poles and wires and building electrical subways was completed. The time limit fixed by the law creating the department in which this work was to be done was set at 1900, but from the progress already made it is fair to presume

THE OLD AND THE NEW IN BOSTON STREETS.

FIG. 1—VIEW OF ATLANTIC AVENUE, BOSTON, SHOWING OVERHEAD WIRES, JANUARY 1, 1895.

FIG. 2—VIEW OF ATLANTIC AVENUE, BOSTON, AFTER REMOVAL OF OVERHEAD WIRES, JANUARY 1, 1896.

that this date will be anticipated by at least two years.

The district covered during 1895 was the most difficult by far, comprising the heart of the business section of the city, where the congested condition of the streets made the work necessarily slow and where the great bulk of the overhead wires, cables and poles were located.

The accompanying illustrations present a very fair idea of the work accomplished on a single street between January 1, 1895, and January 1, 1896, and what is represented here is duplicated all over the district.

In the Commissioner's office in Boston is a splendid collection of similar views, which tell the story in detail, and it is to the courtesy of Captain Brophy, of the Wire Department, that we are indebted for these illustrations.

The portion of the city affected by the underground act comprises an area of 46,415,000 square feet. Of this, the districts prescribed for 1894, 1895 and 1896, contain 28,911,660 square feet. The work has been pushed ahead so rapidly, however, that not only have the 1894 and 1895 districts been fully covered, but 134,000 feet of duct have already been laid in advance of the work for 1896.

The Commissioner's report goes into every detail with a minuteness which can not, of course, be repeated here, but the plain figures of the work accomplished up to February 1, 1896, are sufficiently expressive. They are briefly as follows: 131,028 feet of trench dug, 537,935 feet of duct laid, 1,086,957 feet of cable drawn in, 555 manholes built and 894 service connections.

Of the above duct, 294,867 feet are for light and power, 171,013 feet for telephone and telegraph and 72,055 feet for signaling and miscellaneous purposes.

The following are abstracts from the report, giving some details relating to the work done by the various wire companies interested :

WEST END STREET RAILWAY COMPANY.

During the months of February and March this company completed the drawing of cable into the conduits built in 1894. It consisted of 24,855 feet of lead-covered feed cable, 44,955 feet of unsheathed return cable and 3,400 feet of telephone cable. The feed cable used was of two kinds, viz., paper-insulated and fiber-insulated, each having a cross-section of 500,000 circular mils of copper.

The conduit work for this year was completed July 7. The work was done by the National Conduit Manufacturing Company and consisted of a 16-duct main conduit on Otis street, Winthrop square and Devonshire street, from Summer street to Dock square ; a four-duct branch conduit on Summer street, from Otis street to Federal street, and a branch conduit on Summer street, across Washington street, and on Winter street, from Otis street to Tremont street, containing five ducts from Otis street to Washington street and four ducts across Washington street and on Winter street. The character of the construction is exactly the same as that of 1894.

The feed cable drawn into these ducts is fiber-insulated, made and drawn in by the Standard Underground Cable Company. The work was completed December 4 and consisted of the drawing-in of nine cables along the main line to Dock square, two on Summer street, from Otis street to Washington street, and one the remainder of the way. The cross-section of copper in the return cables drawn in is :

1,500,000	circular mils on main line to Dock square, and on Summer street, from Otis street to Washington street.
633,000	circular mils on Summer street, from Otis street to Federal street, and on Winter street.
900,000	circular mils across Washington street.

These cables are unsheathed 500,000 circular mils, 300,000 circular mils and No. 0000 B. & S. gauge. A four-pair paper-insulated telephone cable, for use in connection with the operation of the underground system, has been drawn in along the lines of conduit and provided with means of connection in the manholes and at the points of feeding.

A terminal pole with nine feeders has been established at Dock square, single connections made at Federal and Tremont streets and a double connection at Washington street.

At places convenient to the rails, connections between them and the return cables in the manholes have been made with insulated cables laid in the soil.

All underground cables have been protected by lightning arresters placed at the junctions with overhead lines.

One accident has occurred on the system laid this year, viz., the burnout of the Dock square terminal pole.

All the work of this year, including the removal of overhead feeders and some guard wires, was completed before January 1, 1896. About one-half of it was beyond the boundary of the 1895 district.

The underground work done during the year comprised 4,128 feet of trench, 42,132 feet of duct, 130,418 feet of cable drawn in, 17 manholes built, 13 service connections.

BOSTON ELECTRIC LIGHT COMPANY.

The duct used in the conduits is cement-lined almost exclusively, while that in the distribution system is wrought-iron. The construction differs from that of last year only in the use of a distribution system. Most of the work of this year was done by the company itself. The cables employed are rubber-insulated and fiber-insulated.

The work done this year comprised 35,003 feet of trench, 209,762 feet of duct, 635,152 feet of cable drawn in, 279 service connectors, 218 manholes built.

Of this, a very large proportion is beyond the limits of the 1895 district. With the exception of a few service connections, all underground construction is complete.

All cable has been drawn in in the 1895 district, but it is estimated that about 15 miles remain to be drawn into the conduit constructed outside the prescribed limits.

The conduit construction was practically completed December 21.

About two-thirds of the overhead wire in the 1895 district have been removed.

NEW ENGLAND TELEPHONE AND TELEGRAPH COMPANY.

The underground work this year is principally an extension of the systems outside of the prescribed district. The construction does not materially differ from that of the previous year.

The work for the year comprises 38,843 feet of trench, 171,013 feet of duct, 159,717 feet of cable drawn in, 188 manholes built, 208 service connections.

Cement-lined duct and paper-insulated cables have been used almost exclusively.

EDISON ELECTRIC ILLUMINATING COMPANY.

The system of this company being already underground, the work done consisted chiefly of increase of service.

Five junction boxes have been set, the largest being a 10-way box.

It will be seen that the work has been chiefly confined to the city proper, north of Dover and Berkeley streets.

The number of feet of trench opened for main and feeder construction is 27,899. There have been 229 service connections made, in addition to numerous repairs and removals. The total amount of tubing laid is 33,233 feet, made up of 8,814 feet of feeder, 19,085 feet of main, 5,334 feet of service, representing 99,699 feet of single conductor.

In a few cases this company has employed the Edison cable instead of tubing for service connections.

All work for 1895 is complete. There were no overhead wires in the 1895 district.

WESTERN UNION TELEGRAPH COMPANY.

This company has extended its underground system by one line of pipe running through State street, Merchant's row, Broad, Milk, India and Central streets, Atlantic avenue and High street, and by a second line through Bedford street, Harrison avenue and Norfolk place. A single pipe was laid throughout, except in State street, where three were laid part of the way, and two the remainder. On account of the increase in the size of the conduit, it was necessary to enlarge the manhole on State street at Congress street; also a manhole was built on the Kneeland street conduit, at a point opposite Tyler street, for the accommodation of the Police Signal Service.

The work was completed November 12, wrought-iron pipe being used exclusively. The cables used are lead-covered and fiber-insulated.

The underground work of this year is complete, and comprises 6,659 feet of trench, 7,019 feet of duct, 5,814 feet of cable drawn in, 7 service connections, 22 manholes built. About 5,000 feet of overhead wire remain to be removed.

BOSTON POLICE DEPARTMENT (SIGNAL SERVICE).

During this year the Police Department has connected its boxes and houses, within the prescribed districts of 1894 and 1895, by an underground system. The work has also been considerably extended into the district prescribed for the year 1896. All of Police Division 4 and that portion of Division 5 which lies north of Dover and Berkeley streets are at present operated underground, and a large section of Division 2 has been supplied with underground ducts and cables.

In addition to the setting up of new signal posts, the work done comprises 2,530 feet of trench, 8,568 feet of duct, 53,555 feet of cable drawn in, 63 service connections, 6 manholes built.

Connections have been made to the systems of the New England Telephone and Telegraph Company, the Western Union Telegraph Company and the combination of small companies at several places, and the ducts in these conduits utilized.

The work of construction was done by Messrs. Donovan & Brock.

The conduit consists mainly of two-inch wrought-iron tubing with screw couplings and the ordinary brick manholes. The cables are lead-covered, of two sizes, viz., six-conductor and seven-conductor, and drawn in by the Safety Insulated Wire Company. The sheaths have been protected against electrolysis by connections to the ground cable of the West End street railway system.

With the possible exception of two post connections, the work within the prescribed districts for 1894 and 1895 is now completed, and all overhead wires therein removed.

BOSTON FIRE DEPARTMENT (FIRE-ALARM BRANCH).

The underground construction has been confined principally to the following streets : Appleton, Broad, Church, Essex, High, Music Hall place, Mt. Vernon, Washington, Winter, while cable has been drawn into conduits on more than 30 different streets.

In addition to its own system, this department uses ducts of the Police Department, New England Telephone and Telegraph Company, Western Union Telegraph Company and the combination of small companies.

On Appleton street a special iron-armored duct and iron manhole of the Cummings & Engelman Conduit Company were placed. With this exception, wrought-iron and cement-lined pipe were used almost exclusively.

Lead-covered cables of Kerite, Clark and Okonite manufacture, containing 10, 19, 37 and 61 conductors, have been drawn in. The sheaths have been protected against electrolysis by connection with the return cable of the West End street railway system.

Work was completed about November 16, and comprised 1,269 feet of conduit, 3,742 feet of duct, 34 service connections, 1 manhole, 24,873 feet of cable (containing 1,091,273 feet of single conductor).

Twelve special boxes of the Boston Auxiliary Fire Alarm Company have been connected to the underground system of this department.

All overhead wires in the district have been removed.

OVERHEAD ELECTRICAL CONSTRUCTION.

All overhead wires in the city have been inspected as often as was possible with the small number of men in charge of this work.

Special attention was given to the proper fusing of wires where they enter buildings, so that there is a marked improvement in the condition of the lines in this respect.

The overhead electrical construction shows a decided improvement during the past year, especially as regards the overhead distribution wires in the 1894 and 1895 districts.

The overhead division have during the year inspected 400 poles, 701 fixtures, 156 lamps, 56,700 feet of cable and 4,649,210 feet of wire. Defects to the number of 15,889 have been found. The owners have been notified and have corrected a very large proportion of them.

A plan of the 1895 district, showing roof and street construction, has been prepared, similar to that covering the 1894 district. It shows the location and ownership of all fixtures, poles and wires.

In the whole city there are, according to the plans on file in the office of the Wire Department, 12,979 poles. Of the detailed amount of wire I am unable to give a correct estimate. In the city proper, north of Dover and Berkeley streets, there were from 65,000,000 to 75,000,000 feet of overhead wire.

INSPECTION OF INTERIOR WIRING OF BUILDINGS.

The work of this division has increased largely over that of last year. It has been impossible to properly inspect old electrical work, owing to

the large increase of new work. This division has been seriously handicapped by the small number of the force.

Special attention has been given to the inspection of temporary wiring for electrical effects in theaters and on the outside of buildings. All hotels, theaters, and large-area buildings have also been inspected. Tests of the insulation of the wiring of theaters and halls have been made, and in a number of instances the wiring has been found to be in a dangerous condition. These defects have been rectified. The Wire Department has been impeded in its work by the fact that contractors, under the law, are not compelled to notify the department before commencing to install electric light or power wiring, neither are electric companies prevented from turning on a current until the new wiring is approved. I would recommend that the law be so amended as to correct these evils.

All fires and accidents caused, or supposed to be caused, by electricity have been investigated. The total number was 91. They are classified as follows:

Fires on outside walls of buildings	5
Fires in the interior of buildings	27
Fires on roofs	2
Fires on poles	4
Fires on trees	8
Bridge fires	6
Burn-outs	8
Injuries	17
Manhole explosions	3
Miscellaneous	11
Total	*91

As a result of the accidents, one man was killed, 13 received severe shocks, bad burns, or were otherwise severely injured, three were slightly injured and two horses killed.

Of the fires, four were caused by abnormal currents entering buildings over low-potential wires, due to crosses on outside, overhead wires, eight were due to defective or unsuitable appliances, three to currents entering buildings over pipes. Of the balance, all but two were on old work.

A detailed account of the fires and accidents is submitted in Appendix A. Particular attention is directed to the fires which occurred November 28 and 29 in the building owned and occupied by Mr. R. C. Winthrop, Jr. I submit plan, sheet No. 3, explanatory of the conditions which led to the fire. The system which caused the fire was not constructed under the supervision of the Wire Department.

REMOVAL OF DEAD AND ABANDONED WIRES, ETC.

The amount of dead and abandoned wires, poles, fixtures, etc., removed, has increased over that of 1894. By the force of the department the following work has been done:

Supervision of the removal by the various owners of the overhead wires, poles and fixtures from the 1895 district and elsewhere.

The removal of 2,740,425 feet of wire, and of all abandoned fixtures. Of the wire, 1,256,000 feet were from the 1895 district.

All second alarms of fire have been responded to, and fires caused by overhead wires investigated.

All requests made by the Fire Department, electrical companies or citizens for the removal of dangerous electrical conditions have been attended to.

Of the dead and abandoned wire taken down by the Wire Department, 114,225 feet have been retained as good.

Chapter 228 of the Acts of 1895 has been enforced as far as was possible. Under this statute the Commissioner of Wires is the sole judge of what constitutes proper insulation of poles and posts used for the transmission of electricity. The use of iron poles for high-potential currents has been condemned. All individuals and corporations using them have been notified, and in most cases they have substituted wooden ones, or have agreed to abandon their iron poles or place their wires underground. Several styles of pole have been submitted to the Commissioner of Wires by the Lamp Department, which is the department that has charge of the city's poles, but they have not met with approval. Under the head of Appendix E will be found the results in detail of the tests of these poles.

The present iron poles owned by the city, and used for the support of arc lights or the carrying of high-tension wires, are a menace and a danger, especially to human life. No time should be lost in properly insulating them. I am of the opinion that this can be done at a small expense.

The present electrical condition of Boston is shown by the following facts:

Number of electric lights in use:		
Incandescent	285,155	
Arc	7,915	
		293,070
Number of motors		4,682
Total electrical horse-power employed for electric power, lighting and heating purposes		41,101
Maximum capacity in mechanical horse-power		54,582
Maximum capacity in electrical horse-power		45,937

Many private plants are not considered in the above estimate.

SUBWAYS.

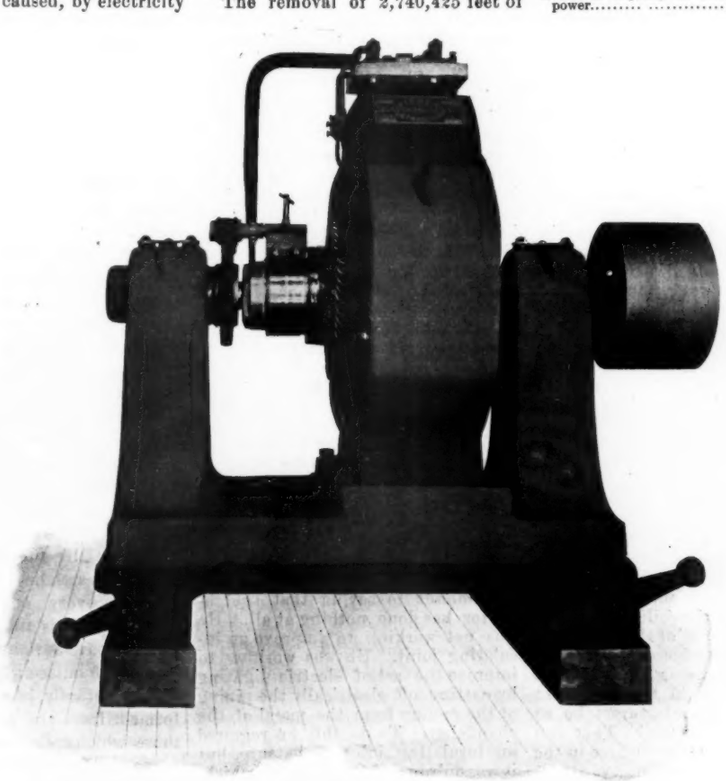
There are in the city 2,625,247 feet of underground duct, of which 1,123,567 feet are for electric lighting and power purposes, 1,343,598 feet for telephone and telegraph, and 158,082 feet for signaling and miscellaneous purposes.

The number of feet of cable in these ducts is 2,452,457. The amount of this cable employed for telephone and telegraph purposes is 732,143, containing, approximately, 150,300,000 feet of wire. The power and lighting cables are 1,562,885 feet in length. For miscellaneous electrical purposes, 157,429 feet of underground cable, containing about 7,952,591 feet of wire, are employed.

The use of electricity has increased during the last year very materially, and the construction has improved. It could be improved far more were there a larger number of inspectors in the department.

JOHN R. MURPHY,
Commissioner of Wires.

* In addition to the above list, there were 28 burn-outs on the underground system of the Edison company reported to the Wire Department.



FISHER ELECTRICAL MANUFACTURING COMPANY'S NEW MULTIPOLAR DYNAMO.

A New Multipolar Dynamo.

The seven-and-one-half-kilowatt dynamo manufactured by the Fisher Electrical Manufacturing Company, of Detroit, and illustrated herewith, represents the latest improvements in multipolar construction. The elevation in the temperature of the machine, after a four hours' run under full load, will not, it is said, exceed 50 degrees. The armature is thoroughly ventilated, of the ironclad type with interchangeable winding, and the winding is so simple that a mechanic of ordinary intelligence can remove or place the coils. The field magnet is of cast-steel and the shunt and series coils are wound on removable spools.

The brushes are of the carbon type and calculated for 30 amperes per square inch; but two brushes are employed on the machine. The commutator is insulated entirely with mica and built of hard copper. The bed-plate is in one casting and very rigid. The main journals, of the self-oiling and self-aligning type, are five and five-eighths inches long by one and three-eighths inch in diameter. The screws of the slide rails go entirely through the bed-plate, making it impossible to pull the machine from the floor by the strain of the belt. The fuse terminals are placed on the top-board, and each machine is arranged for equalizing wires, if desired. The speed does not exceed 1,050 revolutions per minute.

Quick Work with an Electric Gig.

Referring to the value of an electric launch, a dispatch to the New York *Herald*, dated Fortress Monroe, Va., March 18, 1896, says: "Yesterday afternoon, while the boats of the squadron were exercising under sail and oars, a sudden squall capsized the 'New York's' dingy, spilling every one out. The electric gig was riding at the boom near at hand, and one man picked up the dingy's crew. It was fortunate that this gig could be handled so easily, for otherwise, with the very strong tide running and the low temperature of the water, it is doubtful whether all could have been rescued.

A Progressive Insurance Company.

The Mutual Life Insurance Company, of New York, with a true appreciation of the importance and extent of the electrical industry, has removed the restrictions heretofore place on electrical engineers. In the past there has always been an extra charge for insurance in this class. Hereafter there will be no extra charge, and this decision will, we have no doubt, bring to this thoroughly responsible company a vast amount of new business. At the same time it will be of advantage to the electrical fraternity in general.

A bill taxing electric light and gas companies one-half of one per cent of gross receipts has passed both houses of the Ohio Legislature.

Decision in Favor of Stieringer on Combination Fixtures.

The decision below was rendered on March 10, 1896, by Judge Coxe, of the United States Circuit Court for the Southern District of New York, in the case of George Maitland vs. The Archer & Pancoast company. It was a final hearing in equity in an action founded on Reissued Letters Patent No. 11,478, granted March 12, 1895, to Luther Stieringer, assignor to complainant, for an improvement in electrical fixtures. The original, No. 259,235, was dated June 6, 1882, and was applied for March 15, 1882.

Claims 1, 7, 8 and 9 of the original were before the court in the Eastern District of Pennsylvania in Maitland vs. Gibson, 63 Fed. Rep., 126, and were held to be invalid.

The decision of the Circuit Court was affirmed by the Circuit Court of Appeals for the Third Circuit upon the opinion of the Circuit Judge (Id., 840).

The first claim of the original patent was as follows: "A fixture for electric lights, supported from the piping of a house, and electrically insulated therefrom, substantially as set forth." The court held that this claim contained three elements. First, a fixture for electric lights; second, the piping of a house, and, third, means for electrically insulating the fixtures from the piping. That the third element included every kind of insulating device by which two conducting bodies may be mechanically united and yet electrically separated, and that the claim was too broad, and, therefore, void. Claims 7, 8 and 9 were held to be subsidiary and void—as mere aggregations, plainly obvious to the skilled workman.

The complainant construed the decision as awarding him the insulating joint if limited to the precise combination shown, and upon this theory applied for the reissue. So far as relates to the present controversy, the object of the patentee, as stated in the specification, was to utilize the support afforded by the gas pipe of a house for sustaining metallic fixtures for electric lighting containing insulating conducting wires so arranged that the proper connections can be cheaply and conveniently made. He accomplishes this object by carrying the conducting wire from the ceiling, by proper connections, down through the main stem and arms of the chandelier, which may be used also for gas lighting, and is provided with two or more arms and an ornamental shell which hides the wires and connections from view. At the upper end of the chandelier is an insulated joint which separates the chandelier electrically from the grounded piping of the house. The electrical insulation of the fixture from the supporting pipe is as applicable to wall brackets as to chandeliers.

In the course of his decision, Judge Coxe says: A study of this record has convinced me that Stieringer was the first to make the use of gas chandeliers a practical success in the art of electric lighting. The prior structures were not only dangerous, but awkward and ungainly. Stieringer's is absolutely safe, and at the same time the symmetry and the graceful contour of the fixture are preserved. When the conditions surrounding the genesis of electric lighting are remembered, it can hardly be denied that the man who yoked the new art to the old and fully developed the art of electric lighting was something more than a mechanic.

It is plain that he who utilized for electric lighting the expensive and intricate gas-pipe systems then existing, and the fixtures which embodied a multitude of graceful designs, took a long step forward. He made electric lighting cheap, convenient, simple and safe. Of course, it is not pretended that Stieringer was the first to use gas piping and fixtures in this art, but it is thought that he was the first to make the use of an internally wired metal fixture absolutely safe. If any one did this before Stieringer, the record does not disclose his name.

The defendant hardly does justice to Stieringer's achievement when it is asserted that it involved merely the uses of an insulating joint. Grant that, with the idea of putting insulation at the ceiling joint of an internally wired fixture clearly before him, it required nothing but ordinary skill for the workmen to carry out the idea, can it be said that it required no exercise of the inventive faculties to conceive and carry out the idea? A number of accomplished inventors were at work on this very problem. They accomplished nothing; Stieringer succeeded. His combination is in use to-day precisely as he embodied it. There have been some incidental mechanical changes, but the substance is the same. It is not an unreasonable presumption that one who succeeds in doing what so accomplished an inventor as Edison failed to do is on a distinctly higher plane than a mechanic. Not only did Edison fail himself, but he was among the first to recognize the merits of the invention, practically as well as theoretically, for his firm took a license under Stieringer's patent. So did the defendant in the Pennsylvania case, the defendant in this case and afterwards substantially the entire art. The importance of the patent was conceded and acquiescence was well nigh universal.

All this is wholly inconsistent with the theory that the patentee's contribution was perfectly obvious and without patentable merit. The history of the art from 1882 is a refutation of this proposition. Stieringer's joint, located at the ceiling, seems to be regarded as one of the absolutely essential features where an internally wired metal fixture is used. If not essential, why should the defendant and all other manufacturers be so strenuous about its use? They can omit it, or locate it elsewhere in the system with perfect impunity.

It is not pretended that any of the prior patents anticipates. Many of them, though relating generally to electric lighting, do not deal with the heavy and dangerous currents from the dynamo, but with feeble currents in branches of the art entirely distinct from the one now under consideration. Aggregated, they would not show a skilled workman how to utilize the existing gas fixture.

The ferryboat exhibit is unquestionably the best of the defendant's references.

Irrespective of the question whether it was prior to the conception of Stieringer's invention—and of this there is grave doubt—it is thought that it can only be regarded in the light of an experiment that was tried, proved to be an utter failure, and was abandoned.

If his had been the only contribution to the art, electric lighting, in the particulars mentioned, would not have advanced a step. It was dangerous and inefficient. It accomplished nothing. After a trial of two or three months it was abandoned. During this time the joints leaked gas and broke in two. The chandelier was held by the wires alone, and was in danger of dropping on the heads of the passengers. Some of the very dangers which Stieringer sought to avoid were inherent in this structure.

Perhaps its principal vice was the employment of the metal of the chandelier as part of the conducting circuit. It was a one-wire system. The witness who wired the fixture, and who was then a machinist and is now a butcher, describes it fully and accurately. He says, among other things, that it was wired "partly inside and partly out. One wire was inside from the ball joint at the top, the ground wire was soldered on to the pipe; it came through the upper deck overhead and was soldered just below the insulating joint, and that ended it. The other wire ran alongside the pipe and inside the casing from the wooden canopy down to this other wooden ball and then out through and around the wooden ball, and then the branch wires were soldered on to the main wire down to the lamp." It is not surprising that such a structure was a complete illustration of "how not to do it." It was an embodiment of irredeemable inefficiency. Short circuits were formed, a wire would ground on the gas pipe and the lights would go out. The pipe was burned, a hole was burned through the brass canopy, the wires were burned off in the tubing and the joints were wholly inadequate. The structure proved an utter failure; the joints were discarded and the wires placed on the outside.

A meritorious invention should not be defeated upon such proof. In fact, the ferryboat fixture is an indirect tribute to the value of Stieringer's invention. It exhibits the kind of work to be expected of a skilled mechanic, even after the insulating joints were placed in his hands. The mechanic failed. The inventor succeeded. In short, I can not resist the conclusion that Stieringer made an invention of considerable merit, and, this being so, the court, of course, is anxious to give him protection commensurate with his achievement. To confine the invention to some specific form of joint is, as before stated, tantamount to saying that the inventor has done nothing at all. He was not working to improve an insulating joint. He was working to improve the art of electric lighting by cutting off electrically the piping of the ceiling from the metal of the chandelier. To do this he required an insulating joint, to be sure, but it was only one of the elements which, when inserted at the ceiling, made the combination successful. It was this conception which made the valuable contribution to the art. The shops might have been full for years of joints of this character and the art would not have progressed a step. What did advance the art was placing a joint having these characteristics at the ceiling in the manner described. When that was done a combination was created where every element acts upon every other and all are necessary to produce the desired result; in short, a combination having the *per my et per tout* characteristics.

The only other question relates to the reissue. Still confining the discussion to the first claim, it seems too plain for argument that it is much narrower than the first claim of the original. None of the limitations above referred to are in the latter. The claim of the reissue is fully sustained by the original specification and drawings. As soon as the complainant was informed by the final decision of the court that his claim was too broad, he applied for a reissue limiting it to what he thought the court had left in his possession. Of course, no structure would infringe the claim under consideration that would not infringe the broad claim of the original, and no intervening equities have arisen. In such circumstances I know of no authority compelling a ruling that the reissue is void.

It follows that, as to the first claim of the reissue, the complainant is entitled to the usual decree.

Richard N. Dyer and Daniel H. Driscoll were the attorneys for the complainant, and Hector T. Fenton was attorney for the defendant.

Electricity of the Sun.

To the Editor of Electrical Review:

The Electrical Review of October 7, 1893, contained an article on "Electricity of the Sun," in which I made the following remarks: "The sun is an opaque body, pretty much like the earth, and, like the earth, has a corresponding atmosphere. This atmosphere serves as an electrical storage, and the outer part of it is the luminous aurora, increasing in brilliancy as it recedes from the sun. * * * The immense force of gravitation of the sun must be admitted, but, at the same time, it is resisted by a corresponding centrifugal force that renders it fully as inhabitable for animal and vegetable life as the earth."

With similar views I treated the subject in the *Daily Statesman*, of this city, December 6, 1889.

In *McClure's Magazine* for December, 1895, Sir Robert Ball, professor of astronomy at Cambridge, England, on this subject, agrees with these views, and of their importance says: "In the whole range of science one of the most remarkable discoveries ever made is that which has taught us that the elementary bodies of which the sun and the stars are constructed are essentially the same as those of which the earth has been built. * * * This discovery was indeed as unexpected as it is interesting. Could we ever have anticipated that a body 93,000,000 miles away, as the sun is, should actually prove to have been formed from the same materials as those which compose this earth of ours and all which it contains, whether animate or inanimate?"

This "remarkable discovery" of the sun's corona was fully demonstrated from a photograph taken by Professor Schaeberle, of Mina Bronces, Chili, in April, 1893, and loaned by Prof. E. S. Holden, director of the Lick Observatory, to the above-named magazine, which contains a very neat copy of it.

I believe I hold a priority to this discovery so happily confirmed by scientific authority. But the deduction made by the English professor on the subject is not tenable and not in keeping with the nature of the discovery. When he teaches that the origin of solar light and heat is by an ignitious process from a carbonacious source, that the sun is a body of great external heat (a colossal consumer of carbon), and is subject to waste and shrinkage, how could it be possible for the sun to have an organism like that of the earth? He must think there can be

no light without fire, and no fire without carbon. Where is the carbon in the phosphorescent glow of the fire-fly, the female glow worm, or in the flash of lightning, of which the luminosity is kindred to that of the sun? His theory on the origin of solar heat is equally untenable. Admit, as he and other savants advance, the theory of the sun being a ball of fire, the radiation of its heat would not reach the earth within many millions of miles. A light by the window may be seen miles away, but its heat may not be extended as many feet. The glorious sun is governed by the same law.

My views on the production of solar light and heat have been fully explained in previous papers. As far as the temperature of the sun is concerned, whatever its great internal heat may be, its surface varies little from that of the earth, or any other fixed planet. The relative influence of gravitation and electricity regulates the surface temperature of planets, each having its own season in its allotted course in the firmament. It doesn't stand to reason that 1,000 degrees Fahrenheit above or below zero is the temperature of any of God's worlds. The temperature of the great intervening space between the celestial planets evidently is very low; the high altitudes of the earth that are perpetually covered with snow lead us to that conclusion. This low temperature serves an important fact for the transmission of solar light. The chill of Herschel's ether is essential to maintain the brilliancy of solar light in its transmission throughout its divinely appointed confines. The aurora borealis, an electrical phenomenon, gains much of its brilliancy by the intense Arctic chill.

If heat was concomitant with solar light, no light of the sun would reach the earth; but wherever it meets with obstruction, heat is the result.

Ether is strictly a non-conductor of heat. Another function of the non-heating condition of Herschel's ether is to counteract the inflammatory, or rather the ignitious, tendency of the planets so as to maintain their growth and development. Geology teaches this fact as well as that a waste or shrinkage of planets is an impossibility. If a waste, we would ask Professor Ball where the effects of waste would go to?

The principle that regulates the temperature of the face of planets produces not the least of the marvelous operations in nature. It is limited or exists between the two extremes of heat and cold—the great heat in the interior of the planet, and the extreme cold on the outside boundless space. The reasons are produced by this inherent heat as modified by the sun, and temporarily so by wind, moisture and electricity. There are assigned a given heat and light to each planet, the adjustment of which is made through the varied influences of gravitation, hence, the farther off from the sun, the larger the planet. Under this system it takes less solar influences to meet the requirements of Saturn than the earth, as the necessary compensation lies in the effects of its greater size and greater gravitation energy. Should the earth without any physical change take the place of Saturn, and the latter take the place of the former, the earth would freeze nigh to a solid mass and Saturn would be converted into a ball of fire.

Nature in her normally established operations does all things quietly and in order. She builds atomically with imponderable agents. It is true, she has her pathology, but only for reconstructive purposes. She may reveal her forces in a cyclone, bringing destruction to whatever may be in its path, or give vent to the warring elements beneath in an earthquake equally as dire and destructive, or fill the air with fire and thunder; but these are not her established ways. With the sun there is no conflagration, no perturbation in giving light to many worlds and life and joy to the innumerable living.

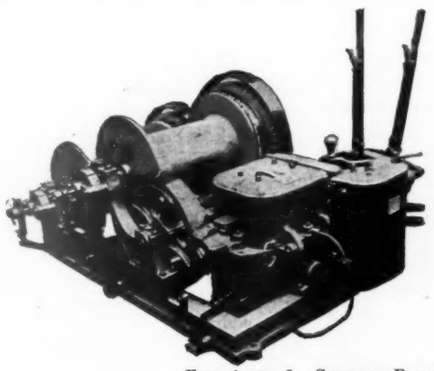
It is a great error to suppose that solar light and heat are elementary bodies. They are but the effects of the physical operations of electro-gravitation. Solar light reaches us, transmitted through Herschel's ether, but the heat of the sun never reaches the earth; but as its electrical light impinges itself on the earth, there it meets with a counter current, and an electrical equilibrium is established with caloric effects. We might in a measure account for the establishment of this equilibrium if we accept the nature of electricity as we do many other things in nature; that is, that electricity is not an unmodified unit, but of different kinds, as different kinds of gases, different kinds of fluids, even different kinds of life as we find it in the animal and vegetable kingdoms. Then by the laws of affinity we would venture on a theory. What psychology is in man, electricity is in nature.

The internal heat confined to planets was the first heat created. It must be very great, yet, still, like boiling water, it must have its limitation. It performs two great functions—it furnishes heat and electricity, and light produced from the latter. We have reason to conclude how this heat is brought about: The force of gravitation of a planet is prodigious beyond conception. The activity of that force tends towards a common center, with the power to give the planet the globular form that all worlds possess. The heat in degree is in the ratio of its gravitation. If the process ended here, the planet would become a ball of fire, and then might waste and shrink; but this heat generated under the pressure of gravitation forms a product as powerful in its dynamic force as gravitation itself; that is electricity.

Primary electricity is the product of gravitation. The two are antagonistic and far-reaching in their respective influences. But as electricity mingles with the more gross imponderables of the Creation, there is no doubt it becomes subject to changes of which we have no knowledge. What leads us to this conclusion is the union of sound with electricity in the telephone, and the impenetrable secret of that force that poises a bird in the air.

G. P. HACHENBERG, M. D.

Austin, Texas, March 19.



FIGS. 1 AND 2.—GENERAL ELECTRIC COMPANY'S PORTABLE ELECTRIC HOISTS.

Walker Manufacturing Company.

It is reported that New York bankers have recently underwritten an issue of $500,000 of bonds for the Walker Manufacturing Company, of Cleveland, Ohio, which may be issued later this year, and will make its total of bonds outstanding, $1,500,000.

OBITUARY.

Irving H. Frost died on March 8 at St. Johnsbury, Vt., where he was born in 1837 and where he had spent almost all of his life. In 1889 he became superintendent of the St. Johnsbury Electric Light and Power Company, a position he held up to the time of his death.

Portable Electric Hoists.

The application of the electric motor to portable hoists for derricks is illustrated admirably in the two hoists which the General Electric Company has lately furnished the United States Government, in connection with an important electrical installation. These hoists are of the double-drum and single-drum type, respectively; the double-drum hoists being operated by a 20-horse-power motor, the single-drum hoist by one of 10 horse-power. Each motor is mounted upon the same bed-plate as the hoist and is of a late and efficient type, resembling in general appearance the well known General Electric 800, so extensively employed in railway service. The parts of the motors are all readily accessible for examination and repair, but are entirely covered in by the motor casing and are thus fully protected against dust, moisture and mechanical injury.

The armatures are ironclad, each coil lying in a slot in the iron core entirely below the outside surface. The motors are sparkless and the bearings are self-oiling. The controllers are known as M R, and embody all the excellent features of the controller K2 used in street car work.

The levers for the brakes, controllers, etc., are so arranged that full control of the entire mechanism is had without change of position by the man in charge.

The hoists themselves are from the works of the Lidgerwood company. The drums are 14 inches in diameter and 26 inches long.

American Institute of Electrical Engineers Incorporated.

The American Institute of Electrical Engineers was incorporated at Albany, N. Y., on March 16. Its principal office is in New York city, and the directors are Louis Duncan and Charles S. Bradley, of Baltimore; W. Anthony, of Dunellen, N. J.; F. B. Crocker, M. I. Pupin, J. J. Carty, W. D. Weaver, W. B. Vansize and C. T. Hutchinson, of New York city; James Hamblet, of Brooklyn; A. S. Hibbard and B. J. Arnold, of Chicago; W. F. C. Hasson, of San Francisco; H. J. Ryan, of Ithaca; Charles Hewitt, A. E. Kennelly and Carl Hering, of Philadelphia; W. J. Hammer, of Elmora, N. J.; C. F. Scott, of Pittsburgh; C. A. Hamilton and R. W. Pope, of Elizabeth, N. J.

KIND WORDS.

ANOTHER GENTLEMAN PLEASED.

TO THE EDITOR OF ELECTRICAL REVIEW:

Having read a few copies of the ELECTRICAL REVIEW, I send you herewith money order for $3, for which you will kindly send me your paper for one year, commencing with the next copy after you receive this letter. I was pleased with the last copy I read beyond my expectation.

Very truly yours,

M. F. H.

Sayre, Pa., March 18.

ELECTRICAL REVIEW

Published at 13 Park Row,

P. O. Box 2339. NEW YORK.

EDITOR:
CHARLES W. PRICE.
ASSOCIATE EDITOR:
STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.

1546 "CORTLANDT," TELEPHONE CALL.

BOSTON OFFICE:
H. G. TUCKERMAN, Room 29, 620 Atlantic Ave.

WASHINGTON OFFICE:
GEO. C. MAYNARD, 800 H St., N. W.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - - .10
Back Copies, each, - - - - - - .25

SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, MARCH 25, 1896.

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THAT PATENT COMMITTEE.

Naturally a great deal of interest has been taken by every one in the electrical field as to the probable make-up of the Committee on Patents which will be appointed by the General Electric and the Westinghouse Electric and Manufacturing companies. From a mass of correspondence on the subject we select the following:

> I think the Patent Committee to manage the affairs of the General Electric and Westinghouse combine will be composed of these gentlemen: Charles A. Coffin, George Westinghouse, Jr., F. P. Fish and Paul D. Cravath. These four will select a fifth. Who he may be only they will know.

The ELECTRICAL REVIEW believes that its correspondent has made a pretty good prediction, although up to the time of going to press the two companies had done nothing final in the matter. In fact, the patent agreement has not yet been signed. That will be done this week, in all probability. After the agreement is officially disposed of, the Committee on Patents will be appointed.

Of course, the commercial and the legal sides of the business will be well represented on the committee. The fifth man should be one of high scientific and technical attainments and undoubted integrity. He may often hold the balance of power.

The insurance interests have apparently reached the conclusion that electricity does not explode and that the calling of the electrical engineer and dynamo man is not extra hazardous. One of the largest companies in the United States has removed the restrictions heretofore applying to this class, and other companies will no doubt follow. Electrical work by competent men is not more dangerous than other work with machinery and tools, and the insurance companies could well have recognized this fact long ago.

Some of our sensational dailies have apparently overlooked the fact that Roentgen's discovery included the ability to see through opaque substances as well as to record shadows through them. Their "scientific" men should be cautioned.

The days of monopoly in the electrical industry are past and gone. We think this fact is recognized in the most powerful and most interested circles.

Who will make the next great discovery? This wonderful century will soon close, but we do not think the record of discoveries need be made up yet.

What an extensive field Roentgen's discovery has opened up for the humorous writers!

THE FINANCIAL SIDE.

The stock market this week was completely professional. The only activity was displayed by the bears, and in the absence of any general support to values they succeeded in establishing moderate declines. Much stress was laid upon the unfavorable commercial situation as expressed in a number of prominent failures in which the liabilities were large. This led to discrimination against commercial paper by the banks, which in turn is working further hardships. The country is now in a season "'twixt hay and grass." Professional wreckers are making the most of the lethargy to depress values. Congress continues to do nothing, and this is perhaps just as well, as the tendencies of that body are towards destructive, rather than constructive, legislation. Railroad earnings maintained their increases of the previous week. The traffic, however, is all eastbound, and cars are going back empty because of the limited purchasing power of the farmer. The ensuing week, from the financial and trade standpoint, does not promise events out of the routine. The stock market will undoubtedly assume a more definite tendency. Chances are even as to the direction which it will take.

The electrical deal, involving the patents of Westinghouse and General Electric was evidently discounted last week. Since then prices of General Electric have ranged between 35⅝ and 37⅝. The close was at 36¼. The significance of this agreement does not appear to be appreciated by the rank and file of speculators. This is enabling so called insiders to acquire considerable additional stock at current prices. The debenture bonds sold between 90½ and 91⅛.

As the date of the annual meeting approaches, there is more or less speculation regarding the showing that will be made for the year ending December 31. It is claimed that the common stock will show 3 per cent. As for the valuation of assets, which has been reduced for two years, owing to depreciation, it is asserted with some show of confidence that there has been a sharp appreciation owing to the better situation of the electrical field, in view of the formation of the patent pool. It is probable that assets will be marked up this year instead of down. This may go a long ways towards correcting that bugaboo—the capital impairment.

There has been considerable speculation as to the treatment which the preferred and common stocks would receive in the scaling which it was thought must occur. It is claimed by some that the preferred is a first lien. The charter specifically states that it has preference for earnings only at the rate of 7 per cent cumulative, but it has no preference as to principal.

I am told by unquestionable authority that the Metropolitan Traction Company will start the electrical equipment of its New York horse

lines very early in the year, and that before the close of 1896 it will have work on 100 miles of track under way. There appears to be no question but that General Electric will secure this contract. Nothing more is heard concerning the Westinghouse underground system since the pool was formed.

The Edison Light Company of Philadelphia declared a dividend of 2 per cent for the quarter, payable March 31. Books closed March 24 and will reopen April 11.

The majority of the General Electric preferred stock has consented to the existence of the committee formed to negotiate a settlement of the 17½ per cent accrued dividends on General Electric. Talk rather favors a cash payment.

The Walker Manufacturing (Electrical) Company, of Cleveland, Ohio, will shortly bring out $500,000 in bonds, making the total outstanding $1,500,000. The proposed issue has been underwritten.

Of the less active industrial securities in the New York market, Edison Illuminating of New York sold at 98 @ 98½.

The consolidated mortgage sold at 102½ @ 102¾ during the latter days of the week. On Monday it sold at 105. The old consolidated mortgage 5's sold at 106½. Fractional lots of American Telegraph and Cable recorded sales at 93 and 94.

The rights of the stockholders of the Philadelphia Edison Light Company to assent to the purchase of their property for $150 per share by the Pennsylvania Heat, Light and Power Company expire to-day. Between 18,000 and 19,000 out of a total or 20,000 shares outstanding assented. Those who remain out will continue to receive their *pro rata* share of the earnings of the company.

On the Boston Exchange, Bell Telephone gained 1 point in the week, selling at 203; Erie Telephone lost 1, closing at 59. New England Telephone was steady at 90 bid and 91 asked. General Electric preferred was steady at 70. In Philadelphia, Pennsylvania Heat, Light and Power Company ranged around 10. Electric Storage common closed the week without net change at 27½. The preferred gained 1 per cent to 29.

The Westinghouse company declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable April 1. Books closed March 23.

BAIN.

March 21, 1896.

It is reported that a contract has been signed by the Central Wisconsin Electric Railway Company and Smith H. Bracey whereby Bracey contracts to build 41 miles of electric line from Oshkosh to Neenah and Appleton, Wis., to be completed by August 1. The bonds of the electric company have been taken by Philadelphia capitalists. Approximate estimate of the cost of the complete work is $700,000. The trolley system will be used. The line will come in direct competition with the Northwest and St. Paul railroads.

ROENTGEN RAYS "ANODIC," NOT "CATHODIC."

BY ELIHU THOMSON.

Since the first publications concerning Roentgen's discovery of the rays emanating from a Crookes tube it seems to have been assumed by most investigators that said rays have some relation to the radiant matter of Crookes, which is a phenomenon of the cathodic terminal.

Others, again, have considered that the rays discovered by Roentgen were produced at the glass surface or during transmission through the glass, and as a consequence of the impingement of the cathode rays upon the glass, causing its fluorescence. Prof. J. J. Thomson is reported to have exposed photographic plates to the cathode rays, or radiant matter, within the tube without having produced any effect which could be brought out by development.

Very recently Prof. H. A. Rowland has pointed out the fact that the Roentgen rays are emitted from the anode and not from the cathode, and this view, coming from so high an authority, is in itself an indication of its probable truth. The writer personally had been led to suspect that the rays were anodic, not cathodic, for it was found that the rays, when traced to their source within the tube by methods which have been published by him, came from that terminal which, during the passage of the spark discharges, could not have been the cathode. Using a Wimshurst machine, it was easy to determine the polarities. Furthermore, the best effects on the photographic plates were produced opposite that portion of the glass which became strongly fluorescent. This fluorescence, however, could not have been produced from the cathode, as the rays normal to the cathode surface would not have impinged there.

By constructing a dark tube with a screen of barium platino cyanide the writer was able to submit to examination the various forms of Crookes tubes in his possession. Some of these, though fluorescing strongly by the cathode rays, gave at no position, with respect to the screen tube, any indications of the emission of Roentgen rays, while some gave feeble indications near the anode, and in exceptional instances a strong effect was noted, not from those parts where the cathode rays made the glass fluorescent, but from other parts opposite the anode.

The crucial test was made by placing a small patch of opaque metal upon the side of a tube opposite the anode. It was found that when the anode, the patch and the fluorescent screen were in line, no fluorescence was obtained, although the screen was fully exposed, as it were, to the cathode.

It may be mentioned here that the fluorescent screen tube forms a most valuable means for rapidly exploring the field of the Crookes tube and so determining whether it can be used as a source of Roentgen rays or not. It also enables one to determine the best direction in which the rays are emitted and is much quicker than the sensitive plate for such observations.

In one of the tubes examined the effects appeared to indicate that the Roentgen, or anode, rays are deflected, or turned aside, sharply when they arrive near the cathode terminal, which in this case was a bent sheet of aluminum. This effect is worthy of further investigation.

The writer also personally exhausted a Crookes tube by a Sprengel pump, watching with the fluorescent screen tube for the first indications of Roentgen rays. It was found that, when that degree of exhaustion was reached which gave an excellent exhibition of radiant matter from the cathode, and even clear-cut shadows of objects by such rays as evidenced by the brilliant fluorescence of the glass where the rays impinged, there still was no indication of Roentgen rays, even when the fluorescent screen in its dark tube was not more than a quarter of an inch from the strongly fluorescing glass wall. As, however, the exhaustion improved, the indications of Roentgen rays began to be manifest, and at last they became quite pronounced. These rays seemed to originate at the anode, and, although they may possibly be deflected in the vicinity of the cathode, they otherwise proceed in straight lines from the anode and through the glass, causing fluorescence of the latter in much the same way, to all appearances, as the cathode rays, except that, while the cathode-ray fluorescence is fairly stable or stationary, the anode-ray fluorescence flits about or changes its direction with every discharge, scarcely, if ever, repeating the same pattern of fluorescent patches on the walls of the tube or bulb.

The following summary of effects is apparently in accord with the facts:

1. Cathode rays are produced at lower exhaustions than give rise to anode rays that reach the glass.

2. Anode rays are best produced at the very highest exhaustions short of insulation.

3. Anode rays pass out through the glass of the Crookes tube; cathode rays (radiant matter) apparently do not.

4. Both anode and cathode rays cause fluorescence of the glass and possibly of many other substances.

It is not known whether anode rays cause fluorescence of any substances that are not so affected by cathode rays, and *vice versa*.

5. Anode rays are erratic in distribution from the anode surface. Cathode rays are of nearly uniform distribution, and leave the cathode surface at right angles.

6. Anode rays are not capable of being deflected by a magnet; at least, not after they have passed the glass. Cathode rays appear to be so deflected within the tube, and after they have traversed an aluminum window. (Lenard.)

7. Diminishing the size of the anode concentrates and focalizes the rays emanating therefrom. Shaping the cathode into a concave cup gives rise to a focus of cathode rays by virtue of their direction being normal to the cathode surface.

The question suggests itself: Can anode rays reach and pass through a thin aluminum sheet which is at the same moment the cathode for the discharge? And, on the other hand, can cathode rays traverse the anode if of thin aluminum sheet? It is probable that opacity of the opposite terminal would be noted in these cases, and possibly deflection of the rays in each case near the terminal of opposite polarity to that emitting the rays.

The significance of Roentgen's discovery is greatly enhanced and the scientific interest therein multiplied when it is recognized that there may be an entirely unsuspected radiation, not from the cathode, but from the anode; that both electrodes may emit radiations characteristic of the electric states of the terminals, and that such radiations are widely different from each other and from other known radiations. If the anode rays are longitudinal waves in the ether, what are the cathode rays? If the cathode rays are longitudinal, what are those of the anode? Is it possible that neither of them are longitudinal vibrations of the ether, and that one must now look for an explanation of the two radiations which shall be alike, and yet not alike?

In these radiations there may be again a manifestation of differences between positive and negative electrical states, which differences seem to be in some way impressed on the radiations set up in the neighborhood of the poles. There undoubtedly is a great field for research opened by the discovery of Roentgen, and it is fortunate for science that the Crookes tube he experimented with possessed a high enough vacuum to cause it to give anodic as well as cathodic rays.

A New Party-Line Telephone Set.

The new "party-line" telephone set, which was worked out by Mr. John A. Barrett, of the American Telephone and Telegraph Company, is being tried in Brooklyn, N. Y. It is a radical departure in telephones. Subscribers to the number of five can be placed on the same line. Each one can be called from "Central" without ringing the bells of the others, and the signal "busy" is shown, and the receiver switch locked, on all idle instruments when one of the series is in use. The new instrument is intended chiefly for residence use. After a trial of a few weeks the verdict is greatly in favor of the improved instrument, as it not only gives service to the satisfaction of the subscriber, but it does away with the many objections heretofore brought against party-line telephones.

In confirmation of news published in the ELECTRICAL REVIEW for March 11, 1896, Consul-General Crittenden reports from Mexico City to the State Department that American capitalists have purchased the entire street railway systems of the City of Mexico. The lines will be electrically equipped. Including the purchase price and the contemplated improvements, about $20,000,000 is involved in the deal. Henry H. Butters, of San Francisco, and Johannesburg, South African Republic, is the head of the syndicate.

THE HISTORY OF ELECTRIC HEATING APPLIED TO METALLURGY.

READ BEFORE THE WASHINGTON SECTION OF THE AMERICAN CHEMICAL SOCIETY BY FREDERIC P. DEWEY.

Sir Humphry Davy is justly regarded as the father of dry electro-metallurgy. After making full allowance for the unusual facilities at his command, it still remains that his intelligent, faithful and extended use of his facilities is worthy of the utmost honor.

It often happens, however, with epoch-making events, that a close search reveals previous indications; so in this case it is found that not only was Davy's dry work preceded by a course of wet electro-chemical experiments, as pointed out by Davy himself, but also an important contribution to dry electro-metallurgy had been made long previous to Davy, and that this even preceded the first observed decomposition of water by the current.

In 1795 a Dutch book of 396 pages was published at Haarlem by Martinus Van Marum, entitled "Second Continuation of Experiments by Means of the Teyler Electric Machine."

I have not seen the original book, but various notices of it appeared in the journals of the time. From these it appears that Van Marum was a thoughtful and exhaustive investigator. His investigations took a wide range and included much outside our title. He, however, not only observed the heat produced by the passage of the current, but he actually measured it. In one instance the temperature of his apparatus, designed for measuring this effect, rose from 61 degrees to 88 degrees in three minutes and to 112 degrees in five minutes. He volatilized phosphorus in a tube and proved it to be "phosphor gas." He investigated the suitaoility of metals for lightning rods, and determined that copper was twice as good as iron. He oxidized metals by the current and performed various melting experiments. He had a scale to measure the current, and at twenty-four 100 feet of iron wire, $\frac{1}{240}$ inch in diameter, melted, while 104 feet melted and separated into globules. He also melted longer pieces, but concluded that such melting tests were not worth the while. Sixty feet of No. 11 wire, $\frac{1}{150}$ inch in diameter, melted at 24.5, but at the same point 36 feet of No. 1 wire glowed its full length, one-half being quite blue and the rest slightly oxidized. Quartz was split up and slightly melted.

Having oxidized the metals by the current, he conceived the idea that the oxides could be again reduced to the metallic state by the application of larger amounts of the current. It does not appear that he actually used electrically produced oxides to test this idea, for he not only did test it, but also actually collected and tested the gas given off.

His furnace, if I may so call it, was a glass tube with platinum electrodes. Into this he put his oxide and passed the current with the following results: Red lead gave lead on the surface of the tube in a few moments that could be gathered up, and in 20 minutes he collected three-quarters of a cubic inch of gas. White lead gave lead in smaller amounts. Tin oxide gave no metal. Red oxide of iron gave no metal. Red oxide of mercury gave mercury and a little gas. He proved that the gas given off was oxygen and credits the decomposition to heat.

In a lecture delivered during the latter part of his life, Sir Humphry Davy gave a history of electro-chemistry, from which I take the following statements:

"The true origin of all that has been done in electro-chemical science was the accidental discovery of MM. Nicholson and Carlisle of the decomposition of water by the pile of Volta, April 30, 1800." "In the month of September, in the same year, I published my first paper on the subject of galvanic electricity in *Nicholson's Journal*, which was followed by six others, the last of which appeared in January, 1801. In these papers I showed that oxygen and hydrogen were evolved from separate portions of water, though vegetable and even animal substances intervened, and conceiving that all decomposition might be polar."

"In 1804, MM. Heisenger and Berzelius stated that neutrosaline solutions were decomposed by electricity, and the acid matter separated at the positive, and the alkaline matter at the negative poles; and they asserted that in this way muriate of lime might be decomposed and drew the conclusion that nascent hydrogen was not, as had been generally believed, the cause of the appearance of metals from metallic solutions."

"In 1805 various statements were made, both in Italy and England, respecting the generation of muriatic acid and fixed alkali from pure water. The fact was asserted by MM. Pachioni and Peele, and denied by Dr. Wollaston, M. Biot, and the Galvanic Society at Paris."

"It was in the beginning of 1806 that I attempted the solution of this question, and, after some months labor, I presented to the society the dissertation to which I have referred in the beginning of this lecture. Finding that acid and alkaline substances, even when existing in the most solid combinations, or in the smallest proportions in the hardest bodies, were elicited by voltaic electricity, I established that they were the result of decomposition, and not of composition or generation; and, referring to my experiments of 1800, 1801 and 1802, and to a number of new facts, which showed that inflammable substances and oxygen, alkalies and acids and oxidable and noble metals were in electrical relations of positive and negative, I drew the conclusions that the combinations and decompositions by electricity were referable to the law of electrical attractions and repulsions."

It is curious that Davy should have overlooked the very early work of Van Marum.

From this work Davy naturally passed to the question of decomposing the fixed alkalies by the current. It is not so much to the work itself, beautiful as it was, to which I wish to direct attention now, as it is to the fact that Davy not only did a vast amount of work and secured wonderful results, but he also clearly pointed out the principles involved, and at this early date enunciated the conditions of successful operation upon which the modern practical applications of electric heat to metallurgical operations rest. He has so plainly traced the history of his work and pointed out the underlying principles that I can not do better than quote his own words. He says:

"In the first attempt that I made on the decomposition of the fixed alkalies, I acted upon aqueous solutions of potash and soda, saturated at common temperatures by the highest electrical power that I could command; though there was a high intensity of action, the water of the solutions alone was affected, and hydrogen and oxygen disengaged with the production of much heat and violet effervescence.

"The presence of water appearing thus to prevent any decomposition, I used potash in igneous fusion.

"By this arrangement some brilliant phenomena were produced.

"I tried several experiments on the electrization of potash rendered fluid by heat with the hopes of being able to collect the combustible matter, but without success, and I only attained my object by employing electricity as the common agent for fusion and decomposition."

Here is the clearest kind of statement of the value of using the current for the double purpose of fusing the material to be acted upon, and for decomposing it. In modern practice this principle was used, notably in the Heroult process of smelting aluminum alloys, and is now used in the successful processes of extracting pure aluminum, such as the Hall process in the United States and its equivalents abroad.

Continuing, Davy said:

"The substance was likewise produced from potash fused by means of a lamp, in glass tubes confined by mercury and furnished with hermetically inserted platina wires by which the electrical action was transmitted."

This may be considered as a hint at electric heating under pressure, as proposed later by Werderman, de Grousilliers and Menges.

And in regard to the production of sodium he said:

"Soda, when acted upon in the same manner as potash, exhibited an analogous result; but the decomposition demanded greater intensity of action in the batteries, or the alkali was required to be in much thinner and smaller pieces."

In modern practice the benefits to be derived from alloying the separated metals, at the moment of their reduction, with another metal, are an essential element of the Cowles and Heroult aluminum alloy processes, and also of various processes of the electrolytic production of caustic soda, notably Castner's process. Here, too, Sir Humphry Davy was early in the field with both work and word.

After describing various obstacles and the conditions necessary in decomposing the alkaline earths as an essential to success, he says:

"Or of combining them at the moment of their decomposition by electricity in metallic alloys, so as to obtain evidence of their nature and properties.

"Barytes, strontites and lime, slightly moistened, were electrified by iron wires under naphtha by the same methods and with the same powers as those employed for the decomposition of the fixed alkalies.

"I had found in my researches upon potassium that, when a mixture of potash and the oxide of mercury, tin, or lead, was electrified in the voltaic circuit, the decomposition was very rapid, and an amalgam, or alloy, of potassium was obtained, the attraction between the potassium and the common metals apparently accelerating the separation of the oxygen.

"The idea that a similar kind of action might assist the decomposition of the alkaline earths induced me to electrify mixtures of these bodies and the oxide of tin, of iron, of lead, of silver, and of mercury, and these operations were far more satisfactory than any of the others.

"These experiments were made previous to April, 1808.

"The earths were slightly moistened and mixed with one-third of oxide of mercury; the mixture was placed on a plate of platina, a cavity was made in the upper part of it to receive a globule of mercury of from 50 to 60 grains in weight; the whole was covered by a film of naphtha, and the plate was made positive and the mercury negative by the proper communication with the battery of 500.

"The amalgams obtained in this way were distilled in tubes of plate glass or, in some cases, tubes of common glass."

In modern practice the crucible or containing vessel is usually used as one of the electrodes, generally the negative. Sir Humphry Davy did the same, but, like Siemens, made his crucible the positive pole, and in this particular case used external heat for fusing his charge. He says:

"I fused a mixture of one part of silex and six of potash in a platina crucible, and preserved the mixture fluid, and in ignition over a fire of charcoal; the crucible was rendered positive from the battery of 500, and a rod of platina, rendered negative, was brought in contact with the alkaline menstruum.

"I tried similar experiments with mixtures of soda and alumina, and soda and zircone, and used iron as the negatively electrified metal."

The work of Sir Humphry Davy was followed by the work of Children, 1809–1815. In his first communication he dealt mainly with the

difference in the results produced by a battery consisting of a small number of large plates, and one consisting of a large number of small plates. The most interesting part of this paper, in tracing the history of metallurgical electric heating, is experiment six, which is undoubtedly the first description of the passage of an electric current through a mixture of ore and resistance material, although it yielded no results. This principle was afterwards very successfully employed by the Messrs. Cowles. In this experiment of Children a mixture of sulphate of barium, red oxide of mercury and clay was submitted to the action of the current.

In his second paper he described his work upon the relative conductivity of wires of various metals, and found that elevation of temperature affected the result.

He subjected various oxides, mostly of the rarer metals, to the action of the current with varying results. Some simply fused more or less; some were also reduced to metal. He also tried some experiments in simple melting.

His crucible consisted of a bit of boxwood charcoal hollowed out on top, with a little mercury in the cavity, serving as one electrode. Upon this was placed a piece of the oxide. The other charcoal electrode was then brought near.

In this is also described Pepy's celebrated experiment to determine that the diamond was really carbon. For this purpose a soft iron was bent and split by a saw; into the split some diamond powder was placed and bound in by fine wire, and the whole covered by leaves of talc. The current was then passed through the wire. The heat produced was not high, but the iron was carburized.

(To be continued.)

A New Line of Electrical Measuring Instruments.

In the matter of portable instruments for alternating current work, the practical electrician has, heretofore, been compelled to chose between the high-grade, high-priced instrument and the low-priced and usually unreliable one. Reliable portable instruments at reasonable prices have been lacking, and as a consequence the demand for them has become both crying and extensive. Realizing this fact, the General Electric Company has undertaken to meet this demand by placing upon the market a complete line of ammeters, voltmeters and indicating wattmeters, giving to the electrician for the first time a line of portable instruments in which full reliance may be placed as standards at a comparatively low figure.

These devices, developed by Prof. Elihu Thomson himself, embody all the improvements which knowledge of every requirement, and long experience suggest. They are compact in form and absolutely accurate, and may be used on all alternating current circuits whatever the frequency and whatever the wave form. No parts liable to change enter into their construction; their calibration and accuracy consequently are insured for an indefinite period. These instruments are of the series type. The difficulties inherent in shunt instruments are thus happily absent. They are dead beat, a depressible button operating an attachment by which the needle is immediately brought to rest without detracting from the sensitiveness of the instrument.

The ammeters are standard for alternating-current work, but may be used with good result on direct-current circuits, in cases where the highest accuracy is not required. The indicating wattmeters give accurate readings with angles of lag on all inductive loads met with in commercial practice. A special field will be found for these in central station practice, testing and calibrating recording meters, testing transformers and measuring their efficiency, in testing the energy consumed in alternating-current arc lamps and incandescent lamps, small fan and other motors, etc.

With the indicating wattmeter, accurate measurements on direct-current circuits may also be obtained, provided two observations for each reading are taken with the instrument connections reversed between the readings—the mean of the two readings giving the correct result. Upon each wattmeter the maximum current at which it may be used is marked. They indicate accurately on any potential from 0 to 150 volts.

The range of sizes of these instruments is such as to meet all and any requirements.

The ammeter is made in the following capacities: 2, 10, 25, 50, 100 and 200 amperes; the voltmeter for 75 and 150 volts, and the indicating wattmeter for 100, 300, 1,500 and 2,500 watts; that for 100 watts having been especially designed for measuring iron losses in transformers and for testing incandescent lamps. The scales are exceptionally long and clear.

In appearance and workmanship the instruments may be favorably compared with the most costly on the market. They are both neat and handsome, having bases of mahogany and covers of polished nickel. Each instrument is packed in a hardwood carrying case. These instruments are known as the Thomson inclined-coil portable alternating-current instruments and the principles of construction can be gathered from the accompanying illustrations.

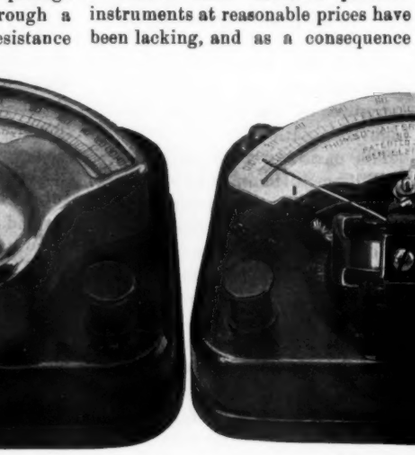

Fig. 1.—Thomson Alternating-Current Voltmeter.

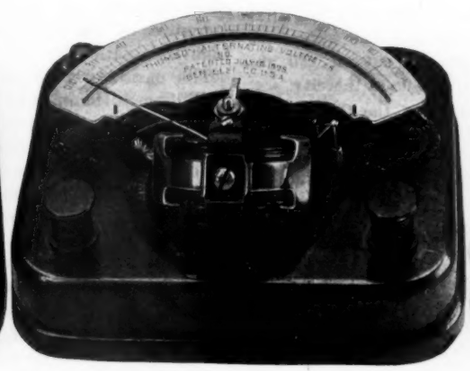

Fig. 2.—Thomson Alternating-Current Voltmeter, with Cover Removed.

Fig. 3.—Thomson Indicating Wattmeter.

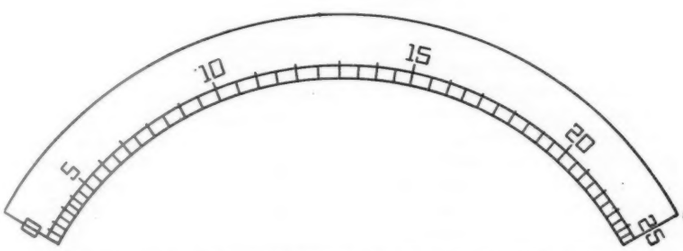

Fig. 4.—Scale of 25-Ampere Thomson Alternating-Current Ammeter. Exact Size.

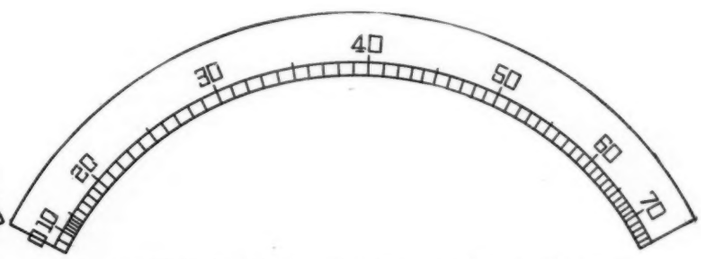

Fig. 5.—Scale of 75-Volt Thomson Alternating-Current Voltmeter. Exact Size.

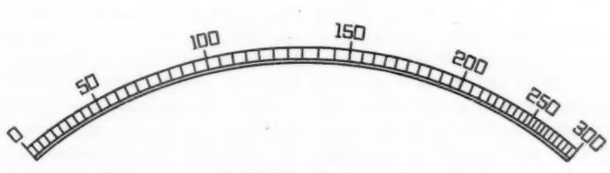

Fig. 6.—Scale of 300-Watt Thomson Indicating Wattmeter. Exact Size.

Mr. R. T. Lozier.

Mr. R. T. Lozier, who is well known in electrical circles, has been appointed eastern agent for the Card Electric Motor and Dynamo Company, of Cincinnati, Ohio. Mr. Lozier has established headquarters in the American Tract Society Building, 150 Nassau street, New York city. The Card Electric Motor and Dynamo Company are manufacturing a full line of standard dynamos and motors. They make a specialty of unusually low speed motors for direct connection to various forms of machinery and tools without intervening gearing or speed-reducing devices.

The Holyoke Street Railway has asked the approval of the Massachusetts Railroad Commissioners for an issue of $150,000 of stock for extensions.

TELEPHONE NEWS AND COMMENT.

The Erie Telegraph and Telephone Company made a net gain of 247 subscribers in February. Total number connected March 1, 18,972.

The annual meeting of the American Bell Telephone Company will be held at 125 Milk street, Boston, at 11 A. M., on March 31. Action will be taken upon the question of increasing the company's capital stock. Transfer books close from March 28 to April 15, both inclusive.

The Board of Trade and Transportation is again urging the passage of a bill by the New York State Legislature to regulate charges of telephone companies for use of their instruments. It provides that rates for unlimited telephone service shall, in cities of 1,000,000 inhabitants, not exceed $125 a year, and in smaller cities, according to size, not to exceed $85, $48, $36, $30 and $27.

Judge Siebecker rendered an interesting decision in the Circuit Court at Madison, Wis., on March 18. A writ of mandamus asked by the Dane Telephone Company to compel the Western Union Telegraph Company to admit new telephones to its offices was denied. It was a test case and will probably be carried to the Supreme Court. In his decision Judge Siebecker said that the principle of public right to use the office of a telegraph company for telephonic purposes, because the company was a common carrier, can not be applied, because a telegraph company might deliver or receive messages on its own terms so long as they were reasonable, and the fact that the defendant did so for the Bell company was a personal privilege or right.

The Boston News Bureau on March 16 said: "It is the opinion of the legal department of the American Bell Telephone Company that, in the Berliner patent case, to be argued before the Supreme Court October 19, the decision of the Court of Appeals in favor of the Bell Telephone Company will be sustained. Practically the same arguments will be presented by the Bell counsel as were heard by the two lower courts. The Berliner patent in its essential features is now being used by other telephone companies, and the Bell company is apparently experiencing no detrimental results therefrom. Should the decision be in favor of the company, a number of suits will be immediately instituted against infringing companies, but damages may not be sought, as in patent suits. It is good opinion that it is useless to endeavor to collect damages. Should the decision be against the company, the Bell people see no reason why the price of the securities should be adversely affected, as the same state of affairs will then exist as at present."

ELECTRIC LIGHT FLASHES.

At the village election in Malone, N. Y., last week the appropriation for electric lights was defeated, and the village will probably be in darkness next month.

Proposals will be received for the construction of waterworks, sewerage system and an electric light plant of 60 arcs and 1,000 incandescents until April 16, 1896, at Eufaula, Ala.

Electricity will take the place of gas for street light in all the First Ward of Chicago. The order was given recently to cut off 250 gas lamps in this section of the city.

A committee of the Ocala, Fla., City Council desires bids for a complete electric lighting plant and 30 miles of wire. Particulars of the matter are given in another column.

It is predicted in Philadelphia that dividends at the rate of six per cent per annum will be started on the preferred stock of the Pennsylvania Heat, Light and Power Company on or about July 1, next. The periods thereafter will be semi-annual—July and January.

A few weeks ago a local paper in Marysville, Mo., stated that the electric light company at that place had had its franchise revoked and had been requested to remove its poles and wires from the streets. The ELECTRICAL REVIEW learns that this report was untrue. On the contrary, the electric light company is giving good service.

The New York State Assembly passed on March 17 H. T. Andrews's bill requiring the elevated railroads in New York city to substitute gas or electricity for illuminating purposes in their cars. The bill requires that the change be made in 40 per cent of the cars the first year, 40 per cent the second year, and in the remainder within three years of the passage of the bill.

Edward Whittle, an oiler, was killed on March 17 by the explosion of the steam chest of an engine in the station of the Madison Square Electric Light Company, formerly the East River Electric Light Company, at 425 East Twenty-fourth street, New York city. The cause of the accident is unknown. The damage caused by the explosion amounted to several thousand dollars.

R. M. & W. T. Johnson, proprietors of the Wicomico Falls Milling and Electric Company, of Salisbury, Md., send the following interesting note on their electric lighting plant: "The Salisbury Electric Light and Power Company's plant was burned three years ago and we purchased the pole line, good will, etc., and instead of operating by steam as formerly we purchased the Wicomico Falls water power within the city limits and attached the system to our water power. We use the Edison three-wire system and have had great success with our water power; in fact, there is no power like it. We operate 1,600 sixteen-candle-power lights in equivalent and our rates are very low—not half the rates charged in the large cities."

The National Conference on Standard Electrical Rules.

A conference upon the rules for the installation and operation of electric apparatus was in session in the hall of the American Society of Mechanical Engineers at 12 West Thirty-first street on Wednesday and Thursday of last week. The meeting was attended by representatives of the leading electrical, architectural and insurance interests, who were called together by invitation of a committee of the National Electric Light Association.

The meetings were presided over by William J. Hammer, of New York, consulting electrical engineer, and C. J. H. Woodbury, of the engineering department of the American Bell Telephone Company, was secretary. A committee made a report on organization.

The rules of the national board of underwriters on electrical installations were read section by section and formed the basis of extended discussions in comparison with other similar rules, both foreign and American.

The question of rules was referred to a special committee, who will submit a report at some subsequent session of this body. Among those present were: Prof. Francis B. Crocker, of Columbia College, representing the American Institute of Electrical Engineers; Frank R. Ford, of the American Street Railway Association; Wm. H. Merrill, of Chicago, Ill., electrician of the National Board of Fire Underwriters; A. S. Brown, of the Western Union Telegraph Company; Francis W. Jones, of the Postal-Telegraph Company; Alfred Stone, of Providence, R. I., secretary of the American Institute of Architects; Capt. Wm. Brophy, of Boston, Mass., of the International Association of Fire Engineers; C. J. H. Woodbury, of the American Bell Telephone Company; Lieut. S. Dana Greene, of the General Electric Company; Charles F. Scott, of the Westinghouse Electric and Manufacturing Company; E. A. Fitzgerald, of the Underwriters' National Electric Association; Edward V. French, electrical inspector of the Associated Factory Mutuals, of Boston.

The Winter's Experience on the Lenox Avenue Conduit Road.

The underground road which the General Electric Company installed on Lenox avenue, New York, has emerged successfully from the tests to which the severe snowstorms of the last month have subjected it. During the violent snowstorm of March 11 the operation of the road did not cease for an instant. The snow began to fall about eight o'clock in the morning, and the snow-sweeper was started out over the line, but before it could make the complete trip the sprocket-wheels of the broom broke, and it was necessary to push the sweeper back into the barn for repairs. Not until four o'clock in the afternoon was it ready to go out on the tracks again. Meanwhile the service of the road was conducted without any stoppage, and the cars ran over the unswept tracks with no greater delay than would be ordinarily caused by considerable slipping of the car wheels on the snow-covered rails. It took about eight or ten minutes longer to make the trip.

At some points on the line the snow was swept by the wind into drifts, making it necessary for the motorman to back his car to get the necessary momentum to push his vehicle through the drifted snow. At four o'clock the snow-sweeper cleared the line of the snow and regular schedule time was again resumed.

About eight o'clock the storm turned to sleet and hail, and, as it fell, covered the rails with ice. Notwithstanding this the cars ran under their usual headway.

On the Lexington avenue electric conduit road a gang of men swept the tracks and on this line the cars made schedule time while the bad weather prevailed.

Throughout the duration of the storm no electrical trouble of any kind was developed, either in the conduit or in the cars.

The rolling stock of the electric conduit lines of the Metropolitan Traction Company is now undergoing a large increase. Equipment has been started on a number of new cars and they will be put into service as soon as they are ready.

ELECTRIC RAILWAY NOTES.

G. H. Earle, Jr., W. F. Harrity and R. W. Clay, Philadelphia capitalists, have purchased a controlling interest in the Indianapolis Street Railway.

Mayor Swift, of Chicago, recently approved the bonds of the General Electric Railway Company, being compelled to do so by mandamus granted by Judge Baker. This company announces that it will use the Lowe underground traction system, and will begin work at once and have cars running before next Winter.

Incorporation papers have been filed in Colorado for a company which is to purchase the street electric and cable railroads of Denver and consolidate them under one management. The capitalization is $3,700,000 and the incorporators are G. R. Holt, G. D. L. Huilen, William Cole and Chas. Sheehan, of New York; Joshua Wilbour, of Providence; Arthur Knight, of East Greenwich, R. I., and George K. Randolph, receiver of the cable line, of Denver.

Judge George W. Wheeler, of the Superior Court at Bridgeport, Ct., granted on March 17 the application of the Norwalk Tramway Company for permission to extend its electric lines to Greenwich, through the towns of Darien, Rowayton and Noroton. The application was opposed by the New York, New Haven & Hartford Railroad Company on the ground that the proposed road would parallel its line, and that it was abundantly able to take care of the traffic. The case will doubtless go to the Supreme Court.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

Electric Light and Power.

GREAT NECK, L. I.—Steps have been taken toward forming this place and Thomaston into a lighting district for the purpose of establishing a system of public lighting in these villages.

MCCOMB CITY, MISS.—A franchise was granted to J. J. White for the erection of an electric light and power plant.

ALDEN, IOWA—The question of electric lights is being agitated here. A canvass of the town shows that 300 lights would be subscribed for.

VERBENA, ALA.—The projectors of the prospective cotton mill at this place propose to put in an electric plant to propel the machinery. Heavy dynamos, to be driven by water power, will generate the electricity, which is to be conducted on heavy wires to the factory for power and lighting purposes.

GAYLORD, MICH.—Business men of this place are working for electric lights and extension of telephone system from Atlantic.

CRIPPLE CREEK, COLO.—This place is to have one of the largest and most complete electric light plants in the State. The directors of the company now operating here met recently and decided to increase the capacity over 100 per cent. This will entail an outlay of fully $50,000. Nothing but the most modern machinery and apparatus will be used. The plant will be so arranged as to supply power for mining and other industries. Work will be begun at once.

FRESNO, CAL.—The City Council awarded the contract for lighting the city to the San Joaquin Electric Company.

EAST BROOKFIELD, MASS.—The Greyhound Bicycle Company is adding an electric light plant to its works for the purpose of lighting its factory. Electrician Frank Drake has charge of the work. The plant will be in working order in the course of a week. This is the first of its kind in East Brookfield.

NEW HAVEN, CT.—The Electric Light Company, of Hartford, is to absorb the Electric Light and Power Company of that city and operate its plant. It is stated that the price of lights will not be increased and that the consolidation is merely for purposes of economy in operation.

HENDERSON, KY.—The contract for building the electric light power house has been let to Connell & Son. An arc light is to be placed at every street intersection in the city.

JERSEY CITY, N. J.—The Street and Water Board has decided to substitute electric lights for gas lamps in the lower section of Jersey City, north of the Pennsylvania railroad.

LYONS, N. Y.—The Board of Trustees has renewed the franchise of the Lyons Electric Light and Power Company for five years, giving it an exclusive franchise to erect poles and string wires in the village for electric light and power purposes.

QUINCY, MASS.—This city is petitioning the legislature for the right to establish an electric light plant of its own.

ELGIN, ILL.—The plant of the Elgin Electric Illuminating Company was sold to Ferris Bros., of Cedar Rapids, Iowa, recently for $15,000.

TACOMA, WASH.—The Tacoma Gas and Electric Light Company is preparing to erect a brick power station on the tide flats.

SUNCOOK, N. H.—It is reported here that the Boston & Maine Railroad is negotiating for land at Garvin's Falls, three miles above this village, on the Merrimack River, and that it intends to use the power for an extensive electric plant, if satisfactory terms can be agreed upon.

PAWTUCKET, R. I.—Within the past week the Pawtucket Gas Company and the Bridge Mill Power Company have sold all their electrical interests to a new company, to be known as the "Pawtucket Electric Company." This is the result of negotiations which have been pending for some time between these two companies, rumors of which have reached the public now and then, but which could not be confirmed.

CHATTANOOGA, TENN.—Additional electric light plants are to be established. Alderman Spencer can give information.

CRIPPLE CREEK, COLO.—Cripple Creek Incandescent Gas Company has been incorporated by James M. Parker, James L. Lindsay, Daniel Weyand, F. S. Treadway and J. R. Gleason. Capital stock, $1,000,000.

EUREKA, CAL.—F. Nelson will establish an electric light plant and will also build an electric railway between Port Kenyon and Fortuna, providing the necessary franchises can be secured.

NORTH GROSVENOR DALE, CT.—The Grosvenor Dale company will construct an electric light plant for lighting its mills, and also the villages of Grosvenor Dale and North Grosvenor Dale.

BOISE, IDAHO. — The Warrens Placer Mining Company, of which W. C. Taylor is superintendent, will put in an electric light plant.

RED BLUFF, CAL.—A. W. Tanner will place an electrical plant on his property at Cherry Creek, a tributary of the Madison, the purpose being to generate 300,000 horse-power by electricity.

MILLINGTON, TENN.—The Consolidated Pump Works will light its factory by electricity. It desires estimates for electric plant.

SALISBURY, N. C.—The Salisbury Electric Company, of which W. Smithdeal is president; R. Lee Wright, vice-president; W. L. Kluttz, treasurer; J. Samuel McCubbins, secretary, will establish an electric light plant. Capital stock, $50,000.

New Electric Railways.

DAYTON, OHIO—The prospect now is that the electric road, that is to be built from this place to Urbana, will be extended to Bellefontaine.

WINONA, MINN.—The Winona Railway and Light Company has been organized here under the Virginia law for the purpose of purchasing the street railway and electric light plants of the Winona General Electric Company, now in receiver's hands, and to be sold April 30.

COLUMBIA, S. C.—The Electric Railway Company will extend its line, and work will be commenced immediately.

ROCKVILLE, MD.—State Senator Hattersly W. Talbott has introduced a bill in the Maryland Senate to grant the Washington, Woodside & Forest Glen Electric Railway Company right to acquire land for road.

MANCHESTER, N. H.—The Chester & Derry Electric Railroad poles and trolley wires are being placed in position.

SALEM, OHIO—A company is being organized by capitalists of Salineville, Hanover and Green Hill to build an electric railway to run from Salineville through Norristown, Green Hill and Hanover.

NEW ALBANY, KY.—The Pennsylvania company, of Silver Grove, has petitioned for franchise to build an electric line.

GLOVERSVILLE, N. Y.—The Mountain Lake Electric Railroad Company has been incorporated, with a capital of $60,000, to operate a street surface electric railroad from this place to Carpenter Lake. The directors are: Charles King, George Hendrie, Richard Ansell, of Johnstown; James G. Haggert and Samuel M. Foster, of Bleecker, and A. J. Zimmer, Elman Hilts, Robert J. Williams, D. R. Bartlett and Myron Hilts, of Gloversville.

PUEBLO, COLO.—Orman & Crook have been awarded the contract to bore the tunnel of the Cripple Creek Electric Traction Company through Beacon and Guyot hills into Raven hill. The tunnel is to be 5,000 feet in length and 10x10 feet in the clear. Through the tunnel electric cars will be operated, and the company proposes to maintain a system of transportation, or a common carrier, for ore belonging to others as well as themselves. Work will be commenced at once.

PORT CHESTER, N. Y.—The building of a trolley road from this place to Greenwich will be commenced this Spring. It is expected to have the road in operation by the latter part of the Summer. After that other branches will be built.

MEADVILLE, PA.—The Meadville Street Railway Company paid into the city treasury recently the sum of $4,000 for a franchise for the erection of an electric street railway. The work of construction will be begun at an early date.

ELMIRA, N. Y.—An electric railroad is to be built from this place to Watkins, a distance of 20 miles, and through cars will be run to connect with Seneca Lake boats. It will be completed about July 1.

KNOXVILLE, TENN. — The West Knoxville Electric Railway Company will erect a plant at this place.

New Telephone and Telegraph Companies.

BELLAIRE, OHIO—The Ohio Valley Telephone Company, of this city, was granted a 30-year franchise by the City Council last week. It is built in opposition to the Bell company and will give a cheaper rate.

SPOKANE, WASH.—Articles of incorporation of the Spokane & Columbia Telephone and Telegraph Company have been filed. The object as set forth is the construction and maintenance of telephone and telegraph lines in the United States and British Columbia. The capital stock, $75,000, is held by Nathan R. Stone, of Spokane; Angus McNish, of Rossland, B. C.; L. Frank Gordon, Jay H. Adams and John D. Farrell, of Spokane. The company will maintain headquarters permanently at Spokane and will do business in all towns along the line of the Spokane & Northern to Northport. The line will then be extended to Rossland and Trail, which are the objective points. A branch from Marcus to Boundary will be run, touching Grand Forks, Carson City, Greenwood City, Boundary Falls, Midway and all other towns as far up as Penticton. In all, 224 miles will be built, but eventually the line will branch out to places where business justifies.

UTICA, N. Y.—During the coming Summer the lines of the Interstate Telephone Company will be extended to Utica.

LOCKPORT, N. Y.—The Common Council has taken action favorable to granting a franchise to the Citizens' Mutual Telephone Company, which promises much lower rates for telephones here.

RYMER, W. VA.—Mannington & Smithfield Telephone Company has been incorporated by R. E. Ice, of Longsport, W. Va., and J. H. Ott, O. H. Arnett, E. L. Cole and others, of Rymer, W. Va. Capital stock, $5,000.

MILLHEIM, PA. — The Millheim Electric Telephone Company has been incorporated by A. Walter, W. L. Goodhart, J. Spigelmyer, of Millheim; C. S. Musser, of Aaronsburg;

E. L. Grawley, of Rebersburg. Capital stock, $3,000.

Increase of Capital.

DELPHOS, OHIO — The Delphos Electric Light and Power Company will increase its capital stock from $40,000 to $55,000.

BROOKLYN, N. Y.—The New York & New Jersey Telephone Company increased its capital stock from $3,500,000 to $5,000,000.

PROVIDENCE, R. I.—An issue of new stock to the amount of $200,000 has been decided upon by the Providence Telephone Company. This will increase the capital from $800,000 to $1,000,000.

HILLSBOROUGH, N. H.—The Hillsborough Electric Light Company has added $10,000 to its capital stock.

ABINGTON, MASS.—The Abington & Rockland Electric Light and Power Company has petitioned the legislature for the right to issue more stock, to the amount of $8,500.

New Manufacturing Companies.

SPRINGFIELD, ILL.—McCaskey & Holcomb company has been incorporated; capital stock, $20,000; to do general manufacturing, electrical distribution of light, heat and electric power. Incorporators, W. T. McCaskey, Eugene Holcomb and M. S. McCaskey.

TRENTON, N. J.—W. S. Griffith company has been incorporated by Chas. S. Solomon, of Philadelphia; Wilfred G. Griffith, of Ambler, Pa., and Francis C. Lothrop, of Trenton, N. J., to manufacture mechanical and electrical appliances of all kinds, etc. Capital stock, $20,000, with $6,000 paid in.

Business Troubles.

ALBANY, N. Y.—The Union Electric Light and Power Company, of Green Island, has dissolved, and J. Edward Ackley, of New York, appointed receiver.

LE MARS, IOWA — The Le Mars electric light and water plant is being advertised to be sold at sheriff's sale on April 15, to satisfy a bonded indebtedness.

LITERARY.

A number of curious radiographs are published in the *Photographic Times* for April.

Prof. Arthur W. Wright, of Yale University, who has lately conducted some remarkably successful experiments with the X rays, has written a paper for the April *Forum* entitled "The Cathode Ray: Its Character and Effects."

Cassier's Magazine has in its April number, among others, the following articles: "Sugar-Making Machinery in Cuba," by A. W. Colwell, with 15 illustrations of different kinds of machines and a plan of a model sugar house; "Electric Metal Heating and Working," by Joseph Sachs, with 11 illustrations, showing different methods of, and apparatus for, heating metals by electricity; "American vs. European Shop Practice," by Robert Grimshaw, and "Floating Cranes and Derricks in the Harbor of Genoa," by L. Luiggi, with three illustrations of typical designs.

The April *McClure's* will contain what is about the first really authoritative and direct account yet given of Professor Roentgen and his discovery of the cathode rays. Immediately on the announcement of the discovery, the editors of the magazine cabled Mr. H. J. W. Dam, of London, to hasten to Würzburg and talk with Professor Roentgen in his laboratory, and learn all there was to be learned of the new marvel in photography. The paper will be illustrated with a portrait of Professor Roentgen and numerous photographs by the new process. A supplementary article by Cleveland Moffett will tell what has been done in America with the cathode rays.

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BIDS FOR LIGHT PLANT.

Bids for a complete electric light plant with a capacity of one hundred arc lights, 2,000 candle-power, and 1,500 incandescent lights, and about thirty (30) miles of wire are wanted by the undersigned committee, appointed by the council of the city of Ocala, Florida. Specifications to accompany bids.

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J. H. LIVINGSTON,
G. A. CARMICHAEL,
JOHN W. PEARSON.

PROPOSAL FOR ELECTRIC LIGHT PLANT AT EUFAULA, ALABAMA.

Sealed proposals will be received by the Mayor and City Council of Eufaula, Alabama, until 6 P. M., April 23, 1896, for erecting and installing complete an ELECTRIC LIGHT PLANT. The proposed plant embraces sixty 1,200 candle-power arc and one thousand 16 candle-power incandescent lamps.

Plans and specifications will be on file, and may be seen at the office of the City Clerk, and copies of specifications, forms, etc., may be obtained from the City Clerk after March 20, 1896.

The right is reserved to reject any, or all bids. P. B. MCKENZIE, Mayor.
G. A. ROBERTS, City Clerk.

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KINDRED INTERESTS

M. R. Rodrigues, 17 to 19 Whipple street, Brooklyn, N. Y., has issued circulars describing the "Premier" products—motors, batteries, induction coils and general supplies.

H. E. Collins & Company, Pittsburgh, Pa., are sending out comparative reports of tests made on the Babcock & Wilcox boiler and the Cahall boiler, in which the latter makes a fine showing. Copies of these reports may be had free on application.

The Berlin Iron Bridge Company, of East Berlin, Ct., has prepared a handsome calendar showing in colors the types of high-class iron construction, of which this well known firm makes a specialty. The calendars are for free distribution and may be had on application.

Harvey Fisk & Sons, 24 Nassau street, New York city, are sending to their customers copies of a new edition of "The Bond Record List of Safe Investments," a valuable pamphlet on the subject named. This list is believed to be reliable and is undoubtedly a great convenience.

The high-speed electric cars supplied by the J. G. Brill company, of Philadelphia, to the Washington, Alexandria & Mount Vernon Railway, are equipped with air-brakes manufactured by the Standard Air-Brake Company, 100 Broadway, New York city, the pioneers in the street-car air-brake business.

The Ball Engine Company, of Erie, Pa., has just completed the last of the three direct-connected engines for the plant of the Apollo Iron and Steel Works, at the town of Vandergrift, Pa. The engines are tandem-compound, built for medium speed, having side-cranks, and are to be connected directly to Westinghouse generators.

The Electric Appliance Company, Chicago, have been fortunate in securing some nice contracts for bare copper wire, acting as western selling agents for the Taunton Copper Manufacturing Company. The product of this mill is well known as a particularly high-grade article, and the Electric Appliance Company hope to make it one of their leading specialties.

Wilfred H. Fleming, 393 Pearl street, New York city, manufacturer of the Fleming dynamo brush, has received a letter from Mr. David Howe, electrician for Reed & Barton, silversmiths, of Taunton, Mass., in which he says: "On investigation I find that the wear of brushes on three machines, in use from one to two years, averages about one-half an inch yearly. As these brushes were five and seven inches long when put on, I shall not need new ones for a long time. With commutator in proper condition, brushes correctly adjusted, the wear is hardly noticeable."

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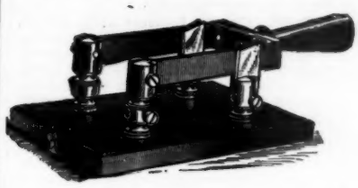

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ELECTRICAL PATENTS

ISSUED MARCH 17, 1896.

556,342 Electric motor rheostat. 556,408 Rheostat; T. J. Fay, Brooklyn, N. Y.—An ordinary rheostat and an electro-motor, the conductors of the motor forming a part of the resistance medium of the rheostat.

556,359 System of multiphase distribution; R. D. Mershon, Pittsburgh, Pa.—A multiphase system of distribution having a given number of main conductors, electric converters having their primary terminals connected with the main line circuits, and a greater number of terminals derived from their secondary circuits than the number of main conductors, a rotary transformer having a single armature winding, and connections from the respective secondary terminals with corresponding points of the armature winding of the rotary transformer.

556,362 Electrical connector for arc lights; J. J. McGill, Thorold, Can.—Consists of an insulator, a ball and socket, metal connection between the end of the loop line wire leading to the lamp and the wire carried by the insulator leading from the line.

556,386 Electrical gas cock; H. L. Tyler, Corning, N. Y.—Consists of a casing having an inlet gas passage, a valve arranged to cover and uncover said passage, and opposite exteriorly arranged electro-magnets, the cores of which are detachably fitted in opposite sides of the casing in line with the valve.

556,425 Electrical registering instrument; H. Lemp, Lynn, Mass.—An electric counter, or register, for alternating current circuits, an actuating electro-magnet having an iron core and coil related so that the iron of the core will saturate with a very small fraction of the maximum current employed in operating the register.

556,426 Electrical metal-working apparatus; H Lemp, Lynn, Mass.—A transformer consisting of a secondary having a central pole of one polarity and a pole or series of poles of opposite polarity ranged around the central or intermediate pole.

556,428 Electric programme clock; J. P. Luxmore, Chicago, Ill.

556,435 Electric elevator; J. Parkinson, Los Angeles, Cal.

556,437 Electric arc lamp; G. C. Pyle, Indianapolis, Ind.—A suitable holding-bar mounted parallel with the upper electrode, a spring-controlled clamp for grasping the upper end of the electrode and slidably mounted on the holding-bar, and an arm extending from the holding-bar and having on its end a ring with a series of inwardly and downwardly extended fingers, or claws, to hold and support the electrode at its lower tapering end.

556,479 Electric arc lamp; T. Spencer, Philadelphia, Pa.—An arc lamp having a frictional feed regulator, a magnet controlling the same, and regulating the length of the arc and an independent stopping device for limiting the extent of slip of the friction mechanism.

556,496 Telephone; C. F. Dunderdale, Chicago, Ill.—A telephone having a diaphragm constituting one electrode, a back piece in proximity to the diaphragm, a conducting body, or conducting bodies, disposed between the electrodes aforesaid and a mass, or quantity, of comminuted or granulated material, the same being a conductor and surrounding the conducting bodies aforesaid.

556,502 Electric drill; Max Hebgen, Butte, Mont.

556,510 Electric switch; N. Marshall, Boston, Mass.

556,516 Electric railway system; B. E. Osborn, Auburn, N. Y.

556,544 Battery connection; M. M. Kohn, Chicago, Ill.

556,553 Railroad crossing signal; R. O'Toole, Thurmont, Md.—Consists of a track and a pair of track bars located beside said track, one in front of the other, with a pair of electro-magnets and a pair of circuit-closers, said circuit-closers being so constructed as to open, except when closed by a weight mechanism connecting the armatures of the magnets with the weights of the circuit closers, for lifting the said weights when the magnets are energized and means for automatically suspending said weights during a specified period after having been raised.

556,602 Underground conductor for electric railways; Geo. Westinghouse, Pittsburgh, Pa.—A conductor for electric railways composed of two like halves fastened together by means of conducting devices and having adjacent contact faces separated by a clear space.

556,609 Telephone switchboard; I. Anderson, Saginaw, Mich.

556,617 Electro-therapeutic apparatus; W. Carter, Louisville, Ky.

556,626 Electric furnace; A. C. Girard, Paris, France.—An electric furnace having a heating chamber and a passageway through said chamber, of lengthwise movable electrodes projecting into said heating chamber and constructed with transverse orifices through which the object to be heated passes, and suitable electric connections for producing a voltaic arc between the electrodes and the said object, said electrodes being movable for the purpose of striking the arc.

556,646 Device for detecting short circuits; C. F. Scott, Allegheny, Pa.—The method of detecting whether or not a closed circuit is present in a given coil which consists in varying the number of lines of force passing through said coil and determining whether or not said coil is heated thereby.

556,670 Block signal telegraphy; C. M. Grace, Philadelphia, Pa.

556,708 Portable faradic battery; J. E. Unger, New York, N. Y.

No Advance in Prices.

[*From the Boston News Bureau, March 17, 1896.*]

A director of General Electric says that there is no intention of putting up prices in view of the patent deal with Westinghouse. The respective companies will not attempt to do more than secure normal prices and prevent cutting. For this reason they believe that the agreement will meet with favor in the trade. Matters have not progressed sufficiently to reach the question of detail, and for this reason the board of control has not been chosen.

TRADE NOTE.

The Bi-Metallic Electric Transmission Company, 26 Cortlandt street, New York city, has favored the ELECTRICAL REVIEW with several samples of its bi-metallic wire. An examination of these shows that the John A. Roebling's Sons Company, who make the wire for the Bi-Metallic company, are turning out a high-grade product.

SPECIAL NOTICE.

We wish to notify our subscribers and others that the edition of the ELECTRICAL REVIEW for March 11, 1896, containing Mr. Nikola Tesla's valuable communication on radiography, is practically exhausted. The news-stand sales of the paper that week were unprecedented in the annals of electrical journalism. We have arranged Mr. Tesla's article in the form of a two-page pamphlet. Five thousand of these have been printed, and they will be supplied, at five cents each, as long as the supply lasts.

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Heller, Wellman & Curtiss, the aggressive electrical and mechanical engineering firm of Buffalo, showed a representative of the ELECTRICAL REVIEW a working model of a new electric elevator which they plan soon to place before the public, and which is likely to command attention in the building construction field.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.
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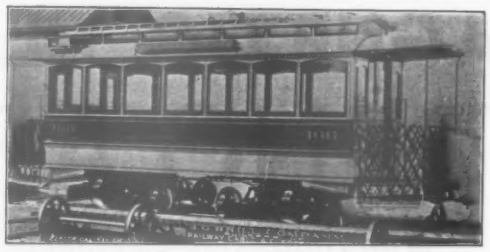

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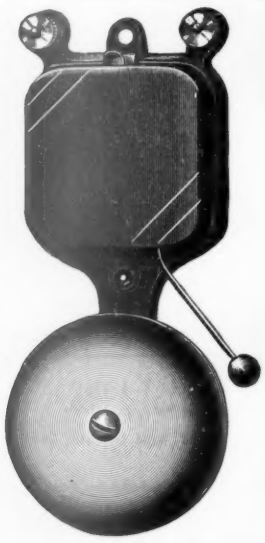

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